Some Personal Experiences in the Use of Electricity in Ophthalmic Practice.

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This report will be limited by request to the use of the galvanic and the form of alternating current known as the sinusoidal. That the subject of electricity in ophthalmic practice has received scant attention appears from a statement by the secretary of this section, Dr. Bulson: "For several years the subject has received no consideration. In 1898 Dr. Starkey read a paper on 'The Use of Galvanism in Pterygium,' and Dr. LeMond on 'The Value of Faradism in Choroiditis.' Since then nothing has been presented except some papers on the galvanic cautery and the magnet."

It is probably safe to say that there is no remedy which causes so varied physiologic manifestations and therapeutic results as electricity. By proper selection of modality, current strength, tension, polarity, length and frequency of application, etc., stimulation or sedation of the nervous and vasomotor systems, muscular contraction, decomposition and destruction of tissue, changes in nutrition and so forth may be produced. This "proper selection" requires a fair working knowledge of the physics and electrotherapeutics of the agent. Ranged on the side of "working knowledge" will be found those (conspicuously neurologists) who are securing recoveries by electric agencies, and have an en-

lightened faith in still greater future conquests, while, on the side of those who lack this knowledge, are conspicuously ophthalmologists who frankly admit this lack, neglect almost completely the use of electricity, and look askance at electrotherapeutics as the real means of recovery from disease which may have previously resisted the classically authoritative drug habit, and prefer to attribute the result to suggestion, coincidence or the bogey man.

Of all the modalities, galvanism furnishes the greatest variety of useful application to the eye as well as the rest of the organism, while, with the possible exception of radiotherapy, it requires the most skill for its safe and successful administration.

For the most part I have used electricity in chronic cases which are very intractable or usually considered not amenable to medication. In order that results may be properly referred to the current, the diagnosis, when possible, has been confirmed by confrères, other treatment avoided, and in several instances patients had been treated without success by the usual approved methods for long periods.

The cases embraced in this paper are taken from my records, without selection, except to include those treated for a sufficient time to warrant a fair conclusion as to the possibilities of the remedy. For the sake of completeness brief mention will be made of cases previously reported.

A word in regard to the nature and selection of the current used, and the technic of its application:

Previous to 1890 the galvanic battery of zinc-carbon elements, excited by a solution of potassium bichromate, was used, and since then the Edison street current, controlled and measured by the rheostat and meter of the ordinary wall plate.

The alternating or sinusoidal current has been taken from a No. 2 Victor transformer, using from 30 to 35 measured volts, and a quantity estimated at 5 milliamperes. As the heat meter is not applicable to so small a quantity, it was thus estimated: With a force of 30 volts taken from the direct current, and the electrodes placed on the lids and the nape of the neck, the meter registered 5 m. a., hence, with the same voltage from the alternating current and the same resistance the current is 5 m. a.

PHYSICAL CHARACTERISTICS OF THE GALVANIC AND SINUSOIDAL CURRENTS.

The maximum voltage of the No. 2 Victor transformer is 70, and the milliamperage probably 1,000. The maximum speed is 2,800 revolutions a minute, and the alternations 5,600. While the current alternates, the sinusoidal wave is unbroken or continuous. Figure 1 represents the wave. Figure A, the galvanic.

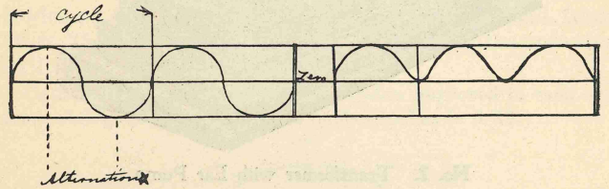
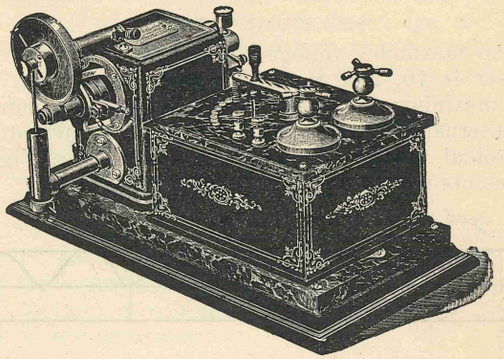


Fig. 1. Fig. A.

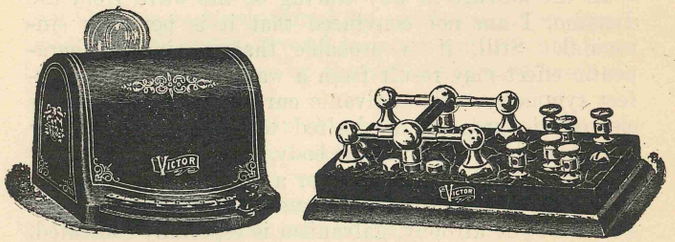
In the absence of any tracing of the wave from the dynamo, I am not convinced that it is perfectly sinusoidal. Still, it is probable that a similar therapeutic effect may result from a wave that lacks its perfect symmetry. The galvanic current is used when its electrolytic property is desired to separate chemically the elements of a pathologic body, and when its polarity may be utilized as a sedative or a stimulant to the muscular, vascular and nervous tissue. For example, in consecutive optic atrophy, galvanism is especially indicated, on account of the existing exudates, while in primary atrophy I much prefer the alternating current, as it appears to be more stimulating to the nerve, the greater reaction of which is evident by the more intense light flash produced.

This can be shown by comparing a thirty-volt current from the dynamo with a thirty-volt galvanic current. The former is not unpleasant and causes a brilliant mosaic of dark and light, while the latter causes no phosphenes unless the current is interrupted and the burning is so intense that it can not be endured for more than a half minute.

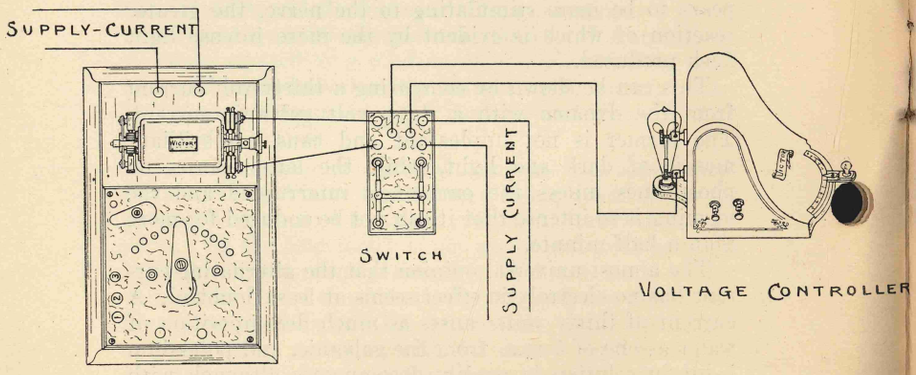
The almost universal opinion that the alternating current has no electrolytic effect seems at least doubtful. A current of thirty volts causes as much decomposition of water as one of 5 m.a. from the galvanic, and potassium iodid in solution is readily decomposed, although with an equal amount of discoloration at each pole.



No. 2. Transformer with Ear Pump.



Switch.



VICTOR No 2 TRANSFORMER

Since the exposure of the eye to the static, high-frequency, *x*-ray or faradic current causes no phosphenes, such currents probably have very secondary if any value in optic atrophy. The technic is as follows except when otherwise stated: Galvanism is generally applied with a large positive pad, 3x4 inches (to prevent smarting) to the nape of the neck, and the negative pads to the closed lids for ten minutes daily, with a current of from 5 to 10 m. a., generally the latter. The electrodes of the sinusoidal are similarly placed and from 30 to 35 volts, as can be tolerated, used for ten minutes daily.

CASE 1.—Double optic atrophy. Vision improved in each eye from ability to count fingers at twelve inches to 6/18.

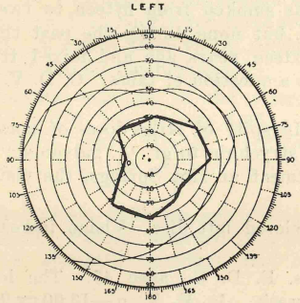


Fig. 2.—Case 19, Feb. 3, 1903.

Patient.—Mr. B., aged 61, was struck on the forehead in August, 1896. When first seen he presented advanced optic atrophy. He had been treated medically at the Illinois Eye and Ear Infirmary for three months and at a South Side hospital, and had been discharged with failing vision and an unfavorable prognosis.

Treatment.—He was treated four months for five minutes daily with galvanism with the cathode to the closed lids and anode to the nape of the neck, with the above result.

CASE 2.—Optic atrophy (left). Vision increased from reading 16 Jaeger to 1 Jaeger.

Patient.—Miss C. S., aged 11, suffered from a sunstroke in June, 1882, and for four months after could only distinguish light with the left eye, then sight improved for five months and remained the same for two months up to May 24, 1883, when letters of 16 Jaeger could be read slowly on the temporal side.

Treatment.—Strychnia gr. 1/32, t. i. d., was administered for a month, when V = 14 J. Galvanism was then applied, as in the previous case, daily for a month, when vision increased to J. 1 at six inches with central fixation.

CASE 3. — Double optic atrophy. R. V. increased from 10/200 to 16/200, L. V. from 6/200 to 10/200.

Patient.—Mr. J. C., aged 53. His sight had been failing for eight months. His history was negative and he had leaden white discs; the vessels were normal.

Treatment.—Galvanism was applied daily to the eyes; hypodermic strychnia daily was increased to 1/16. Treatment was continued one week with above result.

For the past ten years I have abandoned the use of strychnia, as I have never been convinced that it has any curative effect in optic atrophy.

CASE 4.—Double optic atrophy. R. or L. V. = 6/36. No improvement in vision.

Patient.—Dec. 28, 1891, J. P. W., aged 37, noticed a cloudiness before the eyes after a Turkish bath four months previously. He has smoked from fifteen to twenty cigars daily till a year ago, but none during the past three months. He had syphilis sixteen years ago and mixed treatment for two years. There is a question of tabes. O. D. V. = 6/36, O. S. V. = 6/36.

Treatment.—In spite of large doses of potassium iodid and hypodermics of strychnia to gr. 1/8, galvanism for a month and a month's treatment at Hot Springs, the vision remained the same, 6/36.

CASE 5.—Decolored left disc. Vision increased from 20/200 to 20/40.

Patient.—Mrs. E. D. C., aged 47. The left eye has been blurred for a week. L. E. V. c —13.00 = 20/200; temporal side of disc decolored.

Treatment.—After nine galvanic applications to the left eye, V. c — 13.00 = 20/40.

CASE 6.—Vitreous opacities and choroiditis. V. R. E. improved from light perception to counting fingers at 6″. V. L. E. from fingers at 5′ to fingers at 10′.

Patient.—Mr. J. L., aged 26, had failing sight for seven years. His history was negative.

Treatment.—Galvanism was applied to the eyes daily for nine days with the above result. After two and a half months more at the West Side Hospital by mixed treatment V. R. E. = fingers at 1′; L. E. = fingers at 10′.

The rapid improvement under galvanism was in marked contrast to the progress under mixed treatment.

CASE 7.—Dust opacities in the vitreous. R. V. increased from 18/30 to 18/20. L. V. from 18/70 to 18/40.

Patient.—Jan. 25, 1866, H. S. L., aged 58, had noticed a fog before his eyes for four weeks. He had no history of syphilis or of other disease. The discs were decolored.

Treatment.—Galvanism was applied daily for four weeks.

CASE 8.—L. E. Floating bodies in the vitreous; Disseminated atrophic choroiditis. R. V. c glass = 6/15 improved to 6/9. L. V. = 6/15. Not improved.

Patient.—Mrs. P., aged 49. Her sight had always been poor in the left eye; she could not distinguish people across the street. Right fundus normal.

Treatment.—She was treated at long intervals with galvanism. She was confident that vision had much improved.

CASE 9.—R. E., no reflex from fundus. L. E., dust opacities. Vascularization of the vitreous. Retinitis hemorrhagica. V., R. E. = light perception, not improved. V., L. E., improved from fingers at 7″ to 6/22.

Patient.—April 19, 1897, Mrs. M., aged 61. Blindness set in suddenly in the right eye eighteen months previously, and vision had been failing in the left for two months.

Treatment.—After treatment by galvanism daily and hydrargyrum submuriate gr. 1/15 hourly for three and one-half weeks. V., L. E. = 6/22. A month later vision suddenly failed, probably due to a fresh retinal hemorrhage.

CASE 10.—Floating opacities in the vitreous. R. V. improved from 6/12 to 6/6; left, 6/50 to 6/15.

Patient.—March 15, 1897. Mrs. H., aged 64. The right eye failed very much of late, the left had been failing during the past four years.

Treatment.—Galvanism daily for one month with above improvement in vision. Patient returned in a month with V. R. E., 6/7; L., 6/15, and still abundant dust opacities in each vitreous.

CASE 11.—Recovery from nictitation.

Patient.—March 13, 1886. B. H., aged 8, has had nictitation since an attack of measles one year previously. He has had a good deal of pain in the eyes.

Treatment.—Galvanism to the lids daily for eight days. No pain or nictitation.

CASE 12.—Recovery from asthenopia.

Patient.—Oct. 17, 1897, Miss B., aged 21, teacher. Her eyes have been weak and painful since childhood and she has photopsies. She is unable to read more than half an hour with glasses prescribed by an oculist, who referred her to me for treatment. She is troubled with insomnia and dyspepsia.

November 7: After three weeks of galvanism, daily, to the eyes, this patient can read as long as she wishes, has no photopsies, and eats and sleeps well.

CASE 13.—Recovery from asthenopia, headache, and neurasthenia.

Patient.—Nov. 3, 1893. Miss G., aged 15, school girl, has had frontal headache for months and the eyes and head ache after reading an hour in the day or a few minutes in the even-

ing. Comp. H. As. Exoa. 2°, 20′; 8° in accommodation. Ad. 9°, Ab. 4°, converg. 10 m. a., Stim. Ad. 30°. No insufficiency of obliques. Bilateral contraction of visual fields. Glasses, months of prism exercises (Gould), prisms of rest, medication and long vacations afforded no relief to the head or eyes, though her health improved.

Treatment.—Treatment by galvanism was begun Sept. 21, 1896, and continued daily. Dec. 12, 1896. She has rarely had a headache during the electric treatment and can read any length of time in the day or evening with perfect comfort for the past month.

CASE 14.—Retinal thrombosis. Recovery.

Patient.—April 1, 1898. W. A. W., aged 57. The vision of his right eye failed suddenly two months ago, and it is now reduced to counting fingers at 14″. The fundus has a retinal grayish opaque area in the infero-temporal quadrant.

Treatment.—Galvanism, negative to the lids, positive to the nape of neck, 10 m. a. daily. Vision improved daily and on the twelfth day = 6/15, and seeing the second hand numerals on watch 1 m. m. in diameter.

The above cases are fully reported in the *Annals of Ophthalmology,* July, 1898.

CASE 15.—Central retinitis, unimproved.

Patient.—Jan. 20, 1902. Miss O. L., aged 20, noticed failure of sight at the age of 9, one year after an attack of measles. She has been unable to read book type since September. Under hyoscin each eye, with — 0.50 — 1.00 90° = 20/120. There are fine dots of pigment infiltration in each macula.

Treatment.—Treatment with potassium iodid and mercury, and with the interrupted galvanic, and the sinusoidal current failed to increase vision.

CASE 16.—Paresis of r. inferior and internal recti, and of the sphincter pupillæ. Recovery.

Patient.—Feb. 11, 1902. W. F. S., aged 35, clerk. Seven weeks previously he lost consciousness for four days, during which time the right arm and leg were paralyzed. He then recovered consciousness and the use of the arm and leg. Three weeks later diplopia was noticed; this was increased by looking to the left and down. R. hypertropia, 5°; exotropia, 15°.

Treatment.—Interrupted galvanic current; 5 m. a., negative pole to lids, positive to neck, for ten minutes daily.

February 20, exota 8°, R. hyperta 3°. April 2, exota 1°, R. hyperta 2°. April 26, orthophoria. Binocular field of fixation normal.

CASE 17.—Amblyopia exanopsia. R. E. V. improved from 6″ to 2′.

Patient.—April 12, 1902. J. P. S., aged 37, printer. The right eye has diverged since childhood. V. R. E. is now about

the same as it has always been; he can see the tips of the fingers at 6″. Fundus appears normal.

Treatment.—The sinusoidal current to the eye ten minutes daily. Feb. 12, 1903, he can distinguish thumb from fingers at 6′. He is much pleased with the result as he can now see objects approaching from the right side, which enables him to get about the streets more safely.

CASE 18.—Bluish-white atrophy of left optic nerve; slight improvement from light perception.

Patient.—May 15, 1902. L. F. C., aged 45, has noticed the left eye to be defective in sight for ten years, but it could see to read until last winter, and since then vision has gradually failed. V. L. E. = 20/80; V. R. E. = 20/20. L. E. Numerous large and small floating opacities in the vitreous; visual field nearly absent on the nasal side and contracted on the temporal. Health is good; history is negative. On Nov. 4, 1902, he returned with only light perception in left eye.

Treatment.—Sinusoidal current to the eye ten minutes daily. Dec. 22, 1902, can distinguish when the hand is open or shut. He discontinued treatment unexpectedly .

CASE 19.—Retinitis pigmentosa. R. E., — 1.00, 15° = 20/80; improved to 20/40. L. E., — 125, 165° = 20/80; not improved. (Fig. 2).

Patient.—Jan. 29, 1903. Dr. A. B., aged 48, had good sight until an attack of measles in childhood; since then night blindness has prevented him from going out in the evening, and vision has been steadily failing. During the past seventeen years reading or fatigue caused a pain from the frontal to the occipital region, which glasses have considerably relieved. Fundi: Bars and plaques of pigment infiltrated along the peripheral retinal vessels. Family history good. No history of consanguineous marriage.

Treatment.—Sinusoidal current to the eyes daily. On March 2, 1903, there has been no pain in the eyes since treatment.

CASE 20.—Amblyopia exanopsia. R. E. improved from 20/120 to 20/80.

Patient.—Jan. 10, 1903. Maud F., aged 10, has been cross-eyed for some years. Esotropia with red glass test = 20°. Homatropin, R. V. c + 4.50 = 20/120; L. V. c + 4.00 = 20/40.

Treatment.—Galvanic current to the eyes tri-weekly. May 12, 1903, tenotomy of right internal rectus was performed. July 25, esotropia 6°. V. R. E. 20/120. She has stereoscopic vision and 10° range with the amblyoscope. The exercises were repeated bi-weekly.

Nov. 7, 1903: V. R. E. = 20/120. Sinusoidal current to the right eye tri-weekly. Jan. 4, 1904: V. R. E. = 20/80.

CASE 21.—Sequelæ of specific relapsing iritis. V. R. E. improved from ability to count fingers at 10′ to 20/200. L. E. from light perception to 20/70.

Patient.—Feb. 2, 1904. A. N. N., aged 42.

History.—He had a chancre two years ago in May, 1902; five months later, the left eye was attacked with iritis, and seven months later the right. Vision had been good previous to these attacks. He was under the care of an oculist for five months, beginning a week after the attack in the left eye. Hydrarg. and potassium iodid were prescribed. He has taken iodid of potassium up to the present time. At the end of five months, with the right eye he could see to read a letter, but with the left he could not see a hand.

Second Attack.—This occurred August, 1903, in the right eye, and continued two months without treatment. Vision has remained as at present during the past three months. R. E. V. = counting fingers 10′; L. E. has light perception. Under atropin: Pupil of R. E. 3 mm.; pupil of L. E. 2 mm. Fleecy opacities in each vitreous. Retinal vessels and discs invisible. In fixation at 6″ the left eye diverges.

Treatment.—Galvanism ten minutes daily, the negative pole to the nape of the neck and the positive to the lids.

March 7, 1904: R. E. V. = 12/200; L. = 20/200.

April 4, 1904: R. E. V. = 15/200; L. = 15/120. The sinusoidal current to the eyes. Galvanism discontinued.

April 19: R. E. V. = 15/120. Discontinue sinusoidal current to the eyes and apply vibratory pneumatic massage with eye cups to eyes daily for five minutes.

May 2: Vision the same. Discontinue massage and apply the high frequency current from coil and Oudin resonator with vacuum electrodes to eyes daily for ten minutes.

May 13: Vision remains the same. Discontinue the high frequency current and apply galvanism. Dionin 5 per cent. daily for five days, then omit it for two days, and repeat.

Oct. 6, 1904: R. E. V. = 20/200; L. E. V. = 20/70.

Case 22.—Double optic atrophy, probably of cerebral origin. V. R. E. improved from light perception to 20/67. V. L. E. from 20/120 to 20/20.

Patient.—Oct. 3, 1903. L. W., aged 12, school boy, suffered from very severe headache, vomited about twice a week and was very delicate from the age of five to ten. He has been in good health during the past two years. On returning to school September 9 he noticed that he could not see figures well on the blackboard, and for a week past has had to read with his book very near his eyes.

Examination.—Skiascopy: R. E. + 1.00; L. E. — 0.50. Ophthalmoscopy: R. E. very white marginal band with gray center of disc; vessels normal. L. E. opaque white disc; white atrophic choroidal patch to the nasal side of disc and two-thirds its size; vessels normal. (Fig. 3).

Treatment.—Sinusoidal current.

October 23: R. E. V. = Light perception; L. = 20/80.

November 20: R. E. counts fingers excentrically at 6″; L. E. V. = 20/80.

Jan. 7, 1904: R. E. V. = 15/200; L. E. V. = 20/30.

February 4: R. E. V. = 20/120; L. E. V. = 20/20.

March 7: R. E. V. = 20/80; L. E. V. 20/20.

April 25: R. E. V. = 20/70; L. E. V. = 20/20. The papillæ appear as white as when first examined. Treatment discontinued.

Feb. 13, 1906: R. E. V. = 20/50; L. E. V. = 20/20.

Case 23.—Xanthelasma electrocuted.

Patient.—Jan. 18, 1904. Mrs. A. R. J., aged 37.

History.—Four years previously three yellow patches appeared on the lids, one below the right inner canthus, one below and one above the left. They are at present ⅛″ by ¼″ in size.

Treatment.—Hypodermic cocain. Negative galvanic needle beneath the left upper patch, 3 m. a., gradually increased to

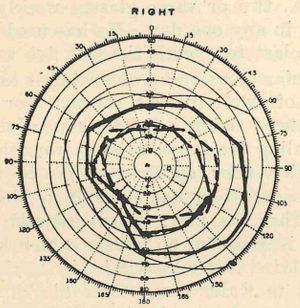


Fig. 3.—Case 22, April 25, 1904. White —; blue — —; red — - — - -

five for four minutes, and this repeated with the needle at right angle to first insertion. There was no pain.

January 30: Patch absent; a small crust present. Needle used as above on the remaining patches.

February 20 and April 21: Needle again used.

May 21: Patches absent.

Case 24.—Tobacco and alcohol amblyopia. Double optic atrophy. V. R. E. improved from 6/100 to 9/100. V. L. E. improved from 4/100 to 9/100.

Patient.—Oct. 4, 1904. H. B. C., aged 36.

History.—His sight began to fail in March, 1904, and he has been unable to read ordinary type since, but he can read large type in the dusk of evening or by artificial light. He has smoked since the age of ten and during the past two years has averaged fifteen pipefuls a day of native tobacco, and washed it down with from three to fifteen whiskies daily. The outer two-thirds of the discs are bluish-white. V. R. E. = 6/100; L. E. = 4/100.

Treatment.—Discontinue toxics; strychnia gr. 1/24 t. i. d.

October 31: R. E. V. = 8/100; L. E. V. = 4/100. Discontinue strychnia. Sinusoidal current to the eyes.

November 9: R. E. V. = 8/100; L. E. V. = 4/100.

December 15: R. E. V. = 9/100; L. E. V. = 9/100. The soreness of the eyes is relieved and he can now read editorials in Frank Leslie, which he could not do previous to treatment.

CASE 25.—Optic atrophy from wood alcohol. V. R. E. ½/100; L. E., 1/100, decreased to ability to count fingers.

Patient.—Feb. 15, 1905. H. B., aged 45, is a fresco painter and plumber.

History.—He gives the following history relative to his loss of vision from inhalation of methyl alcohol. He positively denies ever having taken methyl alcohol in any form to his knowledge. During the past five years has not drank more than two or three glasses of distilled liquor, but has used malt liquors, beer, etc., two or three glasses weekly, and not more than five glasses in any one day. He has used wood alcohol in his work for the last ten years, the last five very freely.

On this particular occasion he was using it to remove varnish from the floors of two air-tight rooms. For three hours he worked on his knees, using a handless steel scraper. All this time he was inhaling the fumes arising from the alcohol, which covered the entire floor space. At no previous time had he ever spent longer than one hour in a closed room doing similar work. Then, as now, he experienced the same dizzy feeling, but this is common, no matter which kind of alcoholic fumes are inhaled. After leaving his work in the closed room he set out to walk home, three blocks distant. He at once became nauseated, the dizziness increased, and, shortly after getting home, he fainted. In about five minutes regained consciousness, and got to bed, but found he could not see. He remained stone blind for one week, then showed some improvement.

December 10: R. V. = 1/100; L. V. = 1/100.

Treatment.—Strychnin sulphate, gr. ⅛, hypodermically, t. i. d. Sinusoidal current daily.

Jan. 5, 1905: R. V. = ½/100; L. E. V. = 1/100.

January 20: R. V. = 1/100; L. V. = 1/100. He can see pictures better and the headlines of a newspaper.

February 3: R. V. = 1/100; L. V. = 2/100.

May 3: R. V. = ½/100; L. V. = 2/100. No treatment has been given since February 15. L. E. cannot count fingers. The disc is bluish white. There is double optic atrophy.

CASE 26.—Impaired vision and headache relieved.

Patient.—March 24, 1905. S. B., school boy, aged 11, fell and struck his head five days previously and has had constant frontal headache since. R. E. V. c. lens = 20/40; L. 20/25. Fundi normal.

Treatment.—Galvanism anode 3 m. a. ten minutes daily to eyes.

April 12: R. E. V. = 20/50; L. = 20/25.

April 25: Adenoids curetted. Galvanism repeated.

May 3: R. E. V. = 20/25; L. = 20/20. There has been little pain in the head except during one-half day at school. Discontinued treatment.

September 16: He has had no headache for three months past and now reads comfortably. V., R. or L. = 20/20.

CASE 27.—Intraocular hemorrhage in right eye, with only light perception; unimproved by three months' previous treatment. Recovery, with normal vision.

History.—May 22, 1904. Dr. A. S., aged 39, was taken ill on March 4, 1904, losing consciousness, and on recovering it two days later found that he could only distinguish light. His memory, hearing, and sight remained bad for a week, and then he recovered. Ten days later he had pain in the left eye in the evening, and the next morning both eyes became again blind. Nine days after the first attack the three oculists consulted agreed in a diagnosis of hemorrhage in each vitreous. Later he consulted four oculists, three of whom agreed with the above diagnosis, while one considered the case choroiditis, with exudates. Under treatment the left eye recovered normal vision, while the right eye has only had light perception since the second hemorrhage.

Previous treatment consisted of pilocarpin injections, atropin and dionin, and subconjunctival injection of cyanid of mercury (once). Electricity had not been suggested. The consultants agreed that the vision of the right eye is hopelessly lost. Leucocythemia and acute toxemia had been diagnosed.

Examination.—R. E. has only perception of light; with dilated pupil the mirror gives no fundus reflex. L. E. V. = 20/20, notwithstanding a considerable amount of fluffy vitreous opacity.

The patient was advised to try galvanism and referred to his oculist, who handed him over to me.

Treatment.—Galvanism with cathode to right lids and current gradually increased from three to ten m. a., for ten minutes daily. After four days fingers could be counted to the right, and four days later in the whole field.

June 7: R. E. V. = 20/67.

June 25: R. E. V. = 20/40, temporarily. He now has annoying diplopia with divergent strabismus, but is assured that this will disappear if vision becomes normal. In April treatment was discontinued.

September 4: R. E. V. = 20/25.

May 11, 1905: R. E. V. 20/20; intermittently = 0.5 (S) at

12″. There is no diplopia. Binocular fixation in reading. Convergence = 10 m. a.

Feb. 14, 1906: R. E. V. = 20/20 fluently = 0.5 (S) at 14″. Vision somewhat clouded by a considerable amount of dust and string opacities in the vitreous. The details of the fundus are distinctly seen and appear normal except as above stated. Advised to renew galvanic treatment.

CASE 28.—Amblyopia (hysterical?) R. E. V. = 20/200, improved to 20/25; L. 20/100 to 20/25.

Patient.—Feb. 15, 1905. Mrs. J. F., aged 44, has never had good eyes.

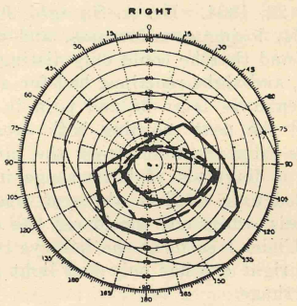


Fig. 4.—Case 28, Feb. 16, 1905. White —; blue — —; red — - — - -

History.—Five years ago, glasses + 2.25 for distance and + 3.50 for reading were prescribed. Her sight has been failing for nine years. She does not remember the time when she could read without a very good light. (Fig. 4.)

General Health.—She has had more than a dozen voluntary abortions. In 1904 she had two miscarriages without severe hemorrhage, and without affecting vision. Three years ago her sight failed very much after the loss of her husband, by accident, and since then she has been subject to heat flashes and profuse sweating hourly in the day and often in the night, accompanied by palpitation.

R. E. V. = 20/200 + 1.75 + 0.50 180° = 20/200 better; L. E. V. = 20/100 + 1.75 = 20/100.

Treatment.—Sinusoidal current to eyes and general electrization with the auto-condensation couch ten minutes daily.

March 2: R. E. V. = 20/100, slowly; L. E. V. = 20/30. The eyes feel stronger. The flashes, sweating, palpitation and nervousness are very much less.

September 21: R. = 20/50; L. = 20/25. This morning she lost the sight of the right eye for an hour.

Feb. 10, 1906: R. E. V. = 20/25 — 2; L. = 20/25+. At

times she can not see to read, and again sees only the left side of words.

CASE 29.—Paresis left internal rectus; improvement.

Patient.—May 31, 1904. Mrs. A. M., aged 25, neurasthenic, noticed three weeks ago that on looking to the right objects doubled. Exotropia 7° at 20′ and R. hypertropia 3½°.

Treatment.—Interrupted galvanic current 5 m. a., negative pole to lids, ten minutes daily.

June 11: Exotropia 5° at 20′; 7° at 13″.

June 28: Exotropia 5° at 20′; R. hypertropia 2°. Diplopia only on fixation 22° to right of median line.

July 7: No diplopia except in fixation beyond 45° to right median line. Discontinued attendance.

CASE 30.—Double specific choroiditis with vitreous opacities. R. E. V. 20/70, improved to 20/50, and asthenopia relieved. L. E. V. 20/20.

Patient.—May 15, 1904. S. G. A., aged 40, a printer.

History.—The right eye was first attacked three and a half years ago and the left eye soon after. During the past year vision has remained, in spite of much treatment, the same as at present.

In the right fundus are numerous large fleecy opacities in the vitreous. In left fundus there are no opacities visible, but the patient complains of floating bodies before the eye. Photophobia is very intense. He is unable to do any evening work on account of pain in the eyes.

Treatment.—His oculist has applied galvanism to the eyes every second day during the past month and referred him to me for further treatment. Galvanism continued, 10 m. a. ten minutes daily. July 1, 1904: R. E. V. = 20/50; L. = 20/20. He can expose the eyes freely to the light and can work all the evening with comfort.

CASE 31.—Right optic atrophy. No improvement. L. E. V. 20/33, improved to 20/20.

Patient.—Oct. 30, 1905. Mrs. R. T., aged 36.

History.—Five days after a miscarriage, six months ago, she had severe supraorbital pain, especially on the right side. The right eye became inflamed and the lids swollen. She had terrible pain, fever and sick stomach for a week.

Examination.—The right papilla is bluish-white; the atrophy is probably toxic. Left fundus appears normal.

Treatment.—Sinusoidal current to eye for ten minutes triweekly. April 3, 1906: L. E. V. = 20/20.

CASE 32.—Xanthelasma. Removed by electrolysis and excision.

Patient.—Jan. 7, 1903. Mrs. C., aged 36, has four yellow patches, two above and two below each inner canthus.

Treatment.—The negative galvanic needle, 5 m. a., completely

removed one patch 2 in. diameter in one sitting. The current was turned on rapidly (without previous anesthesia) and the pain was so severe the patient would not consent to have even a hypodermic needle puncture for further electrolysis, hence the three remaining patches were excised under chloroform.

CASE 33.—Opacities in the vitreous. L. E. V. improved from 20/70 to 20/40 and epiphora relieved.

Patient.—Nov. 9, 1905. S. F., aged 54. The right eye has a mature senile cataract. He has light perception; no visual field. The vision of left eye has been failing for one year. There are posterior annular staphyloma and constant epiphora. L. E. V. c — 12.00 = 20/70.

Treatment.—Galvanism.

Jan. 6, 1906: L. E. V. = 20/40. He does not now see specks before the eyes and has no epiphora.

CASE 34.—Sequelæ of iritis. V. R. E. counts fingers at 8′, improved to 6/50. V. L. E. fingers at 3′, improved to seeing fingers at 10′.

Patient.—June 5, 1900. Mrs. J. B., aged 55, has had repeated attacks of iritis during the past eighteen months.

Examination.—R. E.: Pupil semi-dilated and irregular; floating opacities in the vitreous and capsular opacity. L. E.: Vision failed years ago. There is a large capsular opacity. Pupil normal size.

Treatment.—Galvanism 5 m. a. ten to fifteen minutes daily.

June 22: Twelfth treatment, R. E. V. = 6/50. L. E. V. = fingers at 10″.

CASE 35.—Alopecia of the lids. Improvement.

Patient.—Jan. 7, 1901. Miss G. B., aged 16, five years ago had an illness and six months later the eyelashes fell out and have grown and fallen out at short intervals ever since. The baldness has now been complete for a month.

Previous Treatment.—Daily massage of the lids for two months and eye-drops tri-weekly for three months without any improvement.

Treatment.—Sinusoidal current to the lids triweekly.

May 23: Lashes have grown to one-half their usual length.

CASE 36.—Amblyopia. Left eye. Vision improved from 20/120 and 3.00 (S) to 20/80 and 2.25 (S).

Patient.—Jan. 5, 1901. Mrs. J. M. C., aged 33, has been unable to read with the left eye for some time. Letters appeared to be surrounded by a yellow circle. Fixation is unsteady. The fundus appears normal. She feels weak and sleeps in the daytime.

Treatment.—Sinusoidal current to the eye triweekly.

February 16: V. L. E. = 20/80. She has improved much in strength and has no inclination to sleep during the day.

CASE 37.—Asthenopia. Relieved by glasses and galvanism.

Patient.—Feb. 4, 1901. M. J. L., aged 33, bookkeeper.

History.—His eyes have never been strong. For some days he has had a constant pain in the left eye. Since 1894 he has worn glasses furnished by an optician and two oculists without much relief.

Examination.—He is wearing + 0.50 75° R. E.; + .75 90° L. E. Under homatropin R. + 0.50 75° = 20/20; L. + 1.00 90 = 20/20, with accommodation exophoria 2° at 20′, 8° at 13″. Prism ad. 7°, ab. 6°, convergence = 6 m. a.

Has not binocular fixation in reading without prisms of 3° base in each eye.

Treatment.—Cylinders with above prisms. Galvanism, three m. a., anode to lids, five minutes daily.

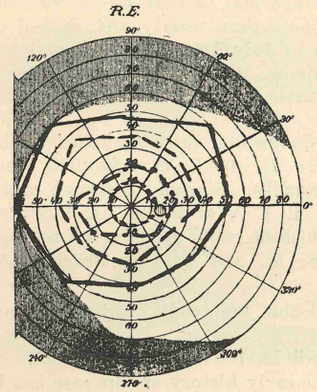


Fig. 5.—Case 39, Feb. 13, 1901. White——; blue — — —; red — - — -; green - - - - -

February 14: Can now read quite comfortable for two hours and has no pain in the eye.

CASE 38.—Pterygium tenuis, right eye unimproved.

Patient.—April 25, 1901. P. V., aged 29.

Treatment.—Bipolar galvanic needles were used under the pterygium with 4 m. a. for two minutes.

July 18: The pterygium the same. The positive needle applied under the pterygium, 2‴ from the cornea, 2 m. a. for two minutes.

August 8: Positive needle twice inserted under the growth with 2 m. a. for two minutes. This procedure repeated August 15.

September 17: The pterygium appears the same as before the first needling.

CASE 39.—Optic atrophy and retinitis circumscripta. Vision in each eye 15/200, improved to 20/50.

Patient.—Dec. 12, 1901. T. L. S., male, aged 54.

History.—His sight began to fail in February, 1900, when ill with fistula in ano, and it has gradually failed, so that for the last two months he can not read the paper.

Examination.—Fundi. R. E. The disc is bluish-white and blurred on the nasal edge. There is a wash-leather-colored stippling in the macular region.

L. E.: The disc is similar to the right. There are white and red dots in the macular region and also two diameters of disc up and in a similar infiltration. Color vision: He can only distinguish blue (Fig. 5). General health: The fistula was operated on and his health is now good. He is subject to chronic rheumatism.

Urine: Normal.

Since a year ago last October he has smoked one-half dozen cigars daily (more than usual) and chewed one ounce of tobacco daily up to July 1, and has not used it since. He does not take stimulants. One daughter died from tuberculosis and one from traumatic spinal meningitis. He lost two uncles from phthisis.

Treatment.—Sinusoidal current applied to the eyes daily.

Jan. 14, 1902: R. and L. V. = 20/200. Mercury and potassium iodid internally. Sinusoidal current continued.

January 23: R. E. V. = 20/200. L. V. = 20/120. He reads a letter now which he could not do when he began treatment.

February 18: R. and L. V. = 20/50 = 0.5″ with reading glasses.

CASE 40.—Double amblyopia, ending in optic atrophy and blindness.

Patient.—April 12, 1901. M. K., aged 25.

History.—The early history of this case has been lost, except that on March 30, 1900, the V. L. E. was 20/30 and the eyes were being treated by galvanism, and on September 5 the vision was the same. The first visit was about August, 1899. In December, 1900, and in January, 1901, he was treated by a New York oculist for two months by general massage and mercurial inunction, with administration of strychnia and iron, and he thinks that vision failed somewhat.

He had been examined by several physicians and neurologists, who gave no positive diagnosis, but that by Dr. Patrick of multiple sclerosis seems best to account for the symptoms. He had been treated by galvanism up to his visit to New York, and on returning to me in January, 1901, treatment by the sinusoidal current to the eyes daily was begun.

In reading the test cards aloud he has to study the letters and to pronounce them at intervals of from two to ten seconds.

Examination.—L. E. V. = 20/30, and at times loses the line. The fundi appear normal.

May 3: V. L. E. = 20/30.

June 28: Vision is the same, with difficult fixation. Repeat.

August 3: V. L. E. = 20/50 very slowly. Sinusoidal current and galvanism to the eyes tri-weekly.

August 30: R. E. V. = 20/50 slowly. The fundus appears normal.

Operation.—Tenotomy of the right external and advancement of the right internal recti.

December 8: L. E. V. = 10/200. There is opaque white atrophy of disc. Temporal three-quarters of disc is dull white. I learned later of the sad ending of the case in total blindness.

CASE 41.—Double primary optic atrophy. Vision improved from uncertain counting of fingers at 6″ to ability to read and to write her letters.

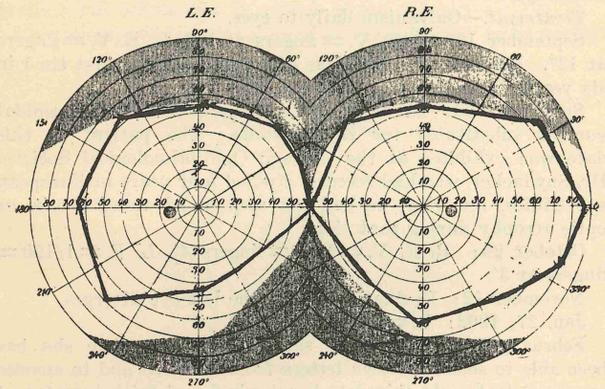


Fig. 6.—Case 41, Oct. 10, 1901.

Patient.—Sept. 3, 1901. Miss E. G., aged 36, school teacher.

History.—Six years previously she became very nervous on account of her inability to secure a certain position, and vision began to fail first in the left, then in the right eye. She noticed words run together and this was not relieved by glasses.

Examination.—Pupillary reaction to light and convergence normal. She confuses pink and gray with green, and blue with red.

R. E.: Gray-white opaque disc, reticulated at site of physiologic cup and sharply defined.

L. E.: Disc similar to right, but not reticulated. Retinal vesels normal (Fig. 6).

General Condition.—A few weeks before the sight failed she was thrown backward from a cart and hurt her back very much, but retained consciousness. Her memory is particularly good. She is subject to sick headache and is very nervous. Patellar reflex is normal.

Family History.—Her father died of nephritis at the age of 61. Her mother is 68 and healthy. She has two brothers and three sisters living. A brother, 33 years of age, commenced to lose sight at 30 and can not see to read. An oculist whom he consulted diagnosed optic atrophy and was unable to state the cause.

Previous Treatment.—Six years ago she was under the care of a prominent oculist for a year in his private hospital in Cincinnati. He diagnosed optic atrophy and prescribed strychnin hypodermically, baths, general massage, nitroglycerin and general faradism.

Vision did not improve and remained about the same as it is at present, that is, she can count fingers uncertainly with either eye at 6″.

Treatment.—Galvanism daily to eyes.

September 12: R. E. V. = fingers at 14″, L. E. V. = fingers at 12″. She read the headlines of a paper for the first time in six years.

September 30: R. and L. V. = fingers at 24″. Sinusoidal current substituted for the galvanic. The patient at this date was exhibited at the Chicago Ophthalmological Society. Dr. Snydacker, who had recently studied four years in European eye clinics, remarked he had not seen so advanced a case of optic atrophy during that time.

October 29: R. E. V. = 1/80 = fingers 4′, L. E. = 1/120 = fingers at 3′.

November 12: In fixation at 12″ the left eye diverges.

Jan. 27, 1902: R. = 1/30, L. = 1/80.

February 10: Vision the same. For some time she has been able to select her own letters from the mail and to answer correspondents. At this date her newly found faith transferred her to the care of the so-called Christian scientists.

CASE 42.—Amblyopia (hysterical). R. and L. V. = 20/80, improved to 20/25.

Patient.—Dec. 17, 1904. M. M., male, aged 10, was referred to me by an oculist.

History.—He was sent from school two years previously on account of failing sight. He had been treated for one year at an eye clinic, but without improvement.

Family History.—His father and paternal grandfather died of apoplexy. His mother died from exhaustion.

Examination.—R. Fundus: Physiologic cup is three times usual size and the vessels emerge very near the nasal side of the disc.

L. Fundus: Similar to right. The boy is exceedingly nervous. The case has been diagnosed as hemeralopia without pigmentation, but night blindness is not complained of and there is no degeneration of the retinal vessels. The small field of vision without optic atrophy is characteristic of hysterical amblyopia, as is also a frequent diplopia.

Treatment.—Sinusoidal current tri-weekly.

March 1: R. = 12/10, L. = 5/100.

April 20: R. = 8/100, L. = 6/100. The fields are concentrically contracted to 20°.

June 24: R. = 14/100, L. = 10/100.

November 28: R. = 14/100, L. = 14/100. Repeat.

December 16: R. = 20/50, L. = 20/67.

Feb. 15, 1906: R. E. = 20/30, L. E. = 20/30.

April 7: R. or L. V. = 20/25.

CASE 43.—Traumatic optic atrophy. V. L. E. = light perception; not improved.

Patient.—April 27, 1904. F. B., aged 16, struck his left eye two weeks previously by running against the tip of an umbrella. The whole disc is opaque white.

Treatment.—Sinusoidal current to the lids daily to bi-weekly.

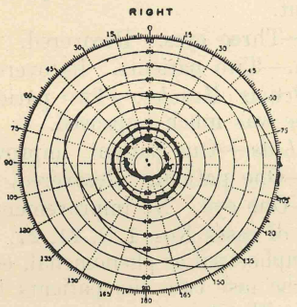


Fig. 7.—Case 41, April 8, 1906. White ——; red and blue — — —

May 3, 1905: There is no improvement in vision and the eye has acquired a divergence of 18°.

SUMMARY OF CASES TREATED ELECTRICALLY.

Optic Atrophy.—Fourteen patients, 23 eyes. In 5 eyes in which vision = light, 40 per cent. were improved. One to seeing hand movements and one to 20/67.

In 18 eyes in which vision = form. Sixty-four per cent. were improved. Four, 60 to 125 per cent.; two, 300 per cent.; three, 500 per cent.; one, 1,500 per cent.; two from seeing fingers to reading. In six there was no improvement.

Vitreous Opacities.—Seven patients, 12 eyes. In 5 eyes vision = light. One improved to counting fingers at 6 inches; one was unimproved. In 12 vision = form. Ninety per cent. were improved: Seven, 40 to

100 per cent.; one, 200 per cent.; one, 1,100 per cent. In one there was no improvement.

Amblyopia.—Seven patients, 10 eyes. All were improved: Four, 20 to 100 per cent.; six, 200 to 700 per cent.

Sequelæ of Iritis.—Two patients, 4 eyes. All were improved: One from light perception to 20/70; one, 100 per cent.; two, 200 per cent.

Intraocular Hemorrhage.—One eye. Vision improved from light perception to 20/20.

Retinitis Pigmentosa.—One patient, one eye. Improved 100 per cent. One eye was not improved.

Retinal Thrombosis.—One eye. Vision was improved from fingers at 14′ to 6/15 and 0.5 at 12 inches.

Sequelæ Central Retinitis.—One patient, two eyes. No improvement.

Asthenopia.—Three eyes. Recovered.

Xanthelasma.—Two patients. Recovered.

Paresis of Ocular Muscles.—Two patients. One recovered and one was much improved.

Alopecia of Lids.—One patient, improved.

Nictitation.—One patient. Recovered.

Pterygium.—One eye. No improvement.

The recovery of cases Nos. 1, 2, 21, 27, 41, 14 and 22 deserve to be emphasized as phenomenal, especially since in all, except the last two, the patients had been previously treated without improvement.

Thus, contrary to the contention of the erudite and lamented Noyes, and "most oculists" (Burnett), electricity does seem to justify its claim to usefulness in ophthalmic practice.